education

Department of Education
FREE STATE PROVINCE

GRADE 11

MATHEMATICS

MARCH TEST
2022

This question paper consists of 6 pages

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of THREE questions.
2. Clearly show ALL calculations, diagrams, graphs, etc. that you have used to determine your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. If necessary, round off answers to TWO decimal places, unless stated otherwise.
5. Diagrams are NOT necessarily drawn to scale.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. Write neatly and legibly.

QUESTION 1

1.1 Solve for x.

1.1.1 $(x-2)(x+7)=0$ (2)

1.1.2 $x(5x-3)=1$ (Correct to TWO decimal places) (4)

1.1.3 $x^2-x-6<0$ (3)

1.1.4 $2^x+2^{x+1}=48$ (4)

1.1.5 $\sqrt{2x-1}+2=x$ (4)

1.2 Solve for x and y simultaneously

$x+6=2y$

$x^2+2xy=3y^2$ (6)

[23]

QUESTION 2

2.1 Simplify the following without using a calculator:

2.1.1 $\dfrac{9^{x+1}-6.3^{2x}}{\left(\sqrt{3}\right)^{4x+1}}$ (4)

2.1.2 $\dfrac{\sqrt{4x^9}-\sqrt{16x^9}}{\sqrt{x}}$ (4)

2.2 Determine the value(s) of k for which the equation $\dfrac{1}{k}=x^2-x+1$ where $k\neq 0$ has real roots. (5)

[13]

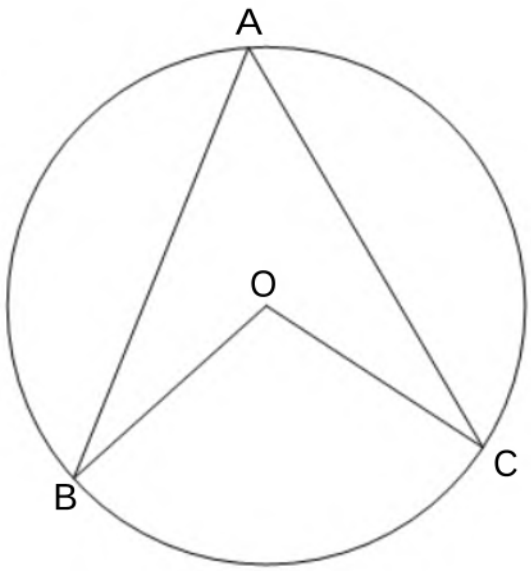
QUESTION 3

Give reasons for your statements and calculations in Question 3

3.1 Complete the following statement

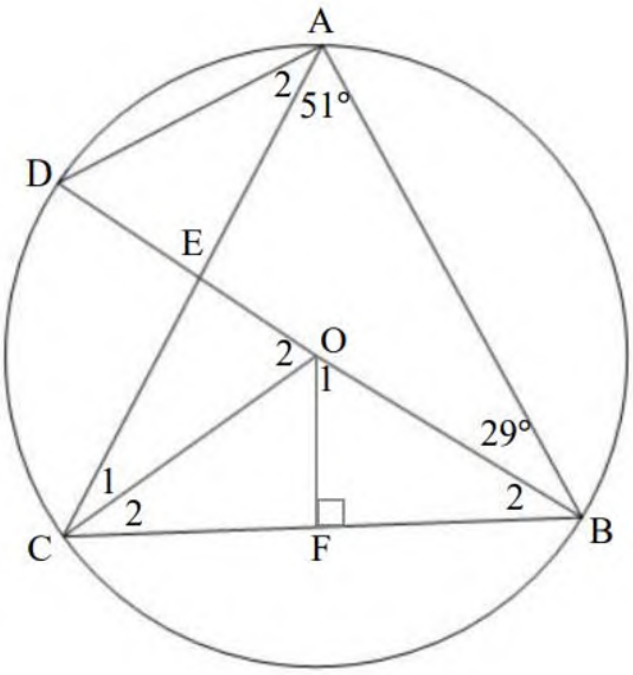
3.1.1 Opposite angles of a cyclic quadrilateral are ..... (1)

3.2 In the diagram below, O is the centre of the circle. A, B and C are points on the circumference of the circle. AB, AC and OC are drawn.



Prove the theorem which states that $B\hat{O}C = 2 \times B\hat{A}C$ (5)

3.3 In the diagram, O is centre of the circle. Points A, B, C and D lie on the circumference of the circle. BOD is a diameter. $\hat{A}_1 = 51^\circ$ and $\hat{B}_1 = 29^\circ$. A line is drawn from O to F such that the length of BC = 24m and radius of the circle centred O is 13m.



3.3.1 Determine the size of $C\hat{O}B$ (2)

3.3.2 Determine the size of $\hat{A}_2$. (2)

3.3.3 Determine the size of $\hat{D}$. (1)

3.3.4 Determine the length of OF. (3)

[14]

TOTAL [50]

NSC

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}[2a + (n-1)d]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r-1} \;;\; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;;\; -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

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GRADE 11/GRAAD 11

MATHEMATICS/WISKUNDE

MARCH 2022

MARKING GUIDELINE/NASIENRIGLYN

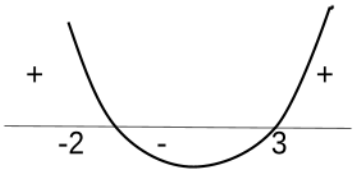
MARKS: 50
PUNTE: 50

These marking guidelines consists of 6 pages.
Hierdie nasienriglyne bestaan uit 6 bladsye.

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- CA applies in all aspects of the marking guideline.

LET WEL:
- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.

QUESTION/VRAAG 1

1.1.1	$x=2$ or $x=-7$	✓ $x=2$ ✓ $x=-7$ (2)
1.1.2	$5x^2-3x-1=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-3)\pm\sqrt{(-3)^2-4(5)(-1)}}{2(5)}$ $=\frac{3\pm\sqrt{29}}{10}$ $=0.84$ or $x=-0.24$	✓ standard form ✓correct formulae ???? ✓ subst into the correct formula ✓ both answers (4)
1.1.3	$(x-3)(x+2)<0$ C.V $x=3$ or $x=-2$  $-2<x<3$	✓ factors ✓ critical values ✓ answer (3)

Marking Guideline

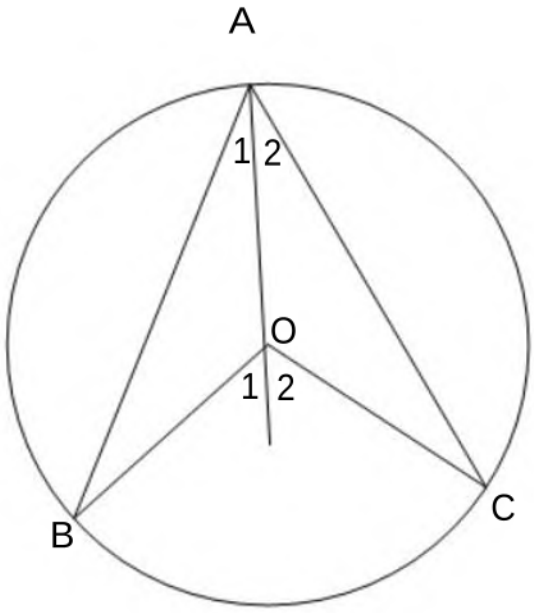
1.1.4	$2^x + 2^x.2^1 = 48$ $2^x(1+2) = 48$ $2^x = 16$ $2^x = 2^4$ $\therefore x = 4$	✓ expansion ✓ common factor ✓ simplification ✓ answer (4)
1.1.5	$(\sqrt{2x-1})^2 = (x-2)^2$ $2x-1 = x^2-4x+4$ $x^2-6x+5=0$ $(x-5)(x-1)=0$ $x=5$ or $x\neq 1$	✓squaring both sides ✓standard form ✓factors ✓answer with selection (4)
1.2	$x = 2y-6$ $(2y-6)^2 + 2y(2y-6) = 3y^2$ $4y^2-24y+36+4y^2-12y-3y^2=0$ $5y^2-36y+36=0$ $(5y-6)(y-6)=0$ $y=\frac{6}{5}$ or $y=6$ $x=2\left(\frac{6}{5}\right)-6$ or $x=2(6)-6$ $=-\frac{18}{5}$ $=6$	✓ x = 2y-6 ✓subst ✓simplification ✓factors ✓both y values ✓ both x values (6)

Question 2

2.1.1	$\frac{3^{2(x+1)}-6.3^{2x}}{\left(3^{\frac{1}{2}}\right)^{4x+1}}$ $=\frac{3^{2x+2}-6.3^{2x}}{3^{2x+\frac{1}{2}}}$ $=\frac{3^{2x}(3^2-6)}{3^{2x}\left(3^{\frac{1}{2}}\right)}$ $=\frac{3}{3^{\frac{1}{2}}}$ $=3^{\frac{1}{2}}=\sqrt{3}$	✓prime factors ✓simplification ✓common factor ✓answer (4)
2.1.2	$=\frac{2\sqrt{x^8x}-4\sqrt{x^8x}}{\sqrt{x}}$ $=\frac{2x^4\sqrt{x}-4x^4\sqrt{x}}{\sqrt{x}}$ $=\frac{-2x^4\sqrt{x}}{\sqrt{x}}$ $=-2x^4$	✓ $\frac{2\sqrt{x^8x}-4\sqrt{x^8x}}{\sqrt{x}}$ ✓ $\frac{2x^4\sqrt{x}-4x^4\sqrt{x}}{\sqrt{x}}$ ✓ $\frac{-2x^4\sqrt{x}}{\sqrt{x}}$ ✓answer (4)
2.2	$1=kx^2-kx+k$ $0=kx^2-kx+k-1$ $\Delta=0$ $b^2-4ac=0$	✓standard form

	$(-k)^2-4(k)(k-1)=0$ $k^2-4k^2+4k=0$ $-3k^2+4k=0$ $k(-3k+4)=0$ $k=0$ or $k=\frac{4}{3}$ $\therefore \Delta>0$ $0<k<\frac{4}{3}$	✓correct subt ✓factors ✓ $\Delta>0$ ✓answer (5)

Question 3

3.1.1	Supplementary or sum up to 180°	✓answer
3.2	 Join AO In ΔAOB	✓Construction Join AO

	$\hat{O}_1 = \hat{A}_1 + \hat{B}$ ext $\angle$ of Δ But $\hat{A}_1 = \hat{B}$ =radii(OA=OB) $\therefore \hat{O}_1 = 2\hat{A}_1$ Similarly in ΔAOC $\hat{O}_2 = \hat{A}_2 + \hat{C}$ ext $\angle$ of Δ But $\hat{A}_2 = \hat{C}$ $\therefore \hat{O}_2 = 2\hat{A}_2$ $\therefore \hat{O}_1 + \hat{O}_2 = 2\hat{A}_1 + 2\hat{A}_2$ $B\hat{O}C = 2(\hat{A}_1 + \hat{A}_2)$ $\therefore B\hat{O}C = 2 \times B\hat{A}C$	✓S/R ✓S ✓S ✓S (5)
3.3.1	$C\hat{O}B = 2(51^\circ) = 102^\circ$ $\angle$at the$\square$ $= 2 \times \angle$at circum	✓S ✓R
3.3.2	$\hat{A}_2 = 39^\circ$ $\angle$in $\frac{1}{2}\square$	✓S ✓R
3.3.3	$\hat{D} = 180^\circ - (90^\circ + 29^\circ) = 61^\circ$ sum of $\angle$ in Δ	✓S/R
3.3.4	In $\Delta C\hat{O}B$ CF= $\frac{1}{2}(24)$ line from centre to midpoint $OC^2 = CF^2 + OF^2$ pyth theorem $13^2 = 12^2 + OF^2$ $OF^2 = 169 - 144$ $OF^2 = 25$ OF=5m	✓S/R ✓Subst into pyt ✓answer